VTT Technical Research Centre of Finland

Drivers and Challenges of Bio-based Economy in Europe

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DRIVERS AND CHALLENGES OF BIO-BASED ECONOMY IN EUROPE

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VTT Technical Research Centre of Finland Ltd

Few words of VTT

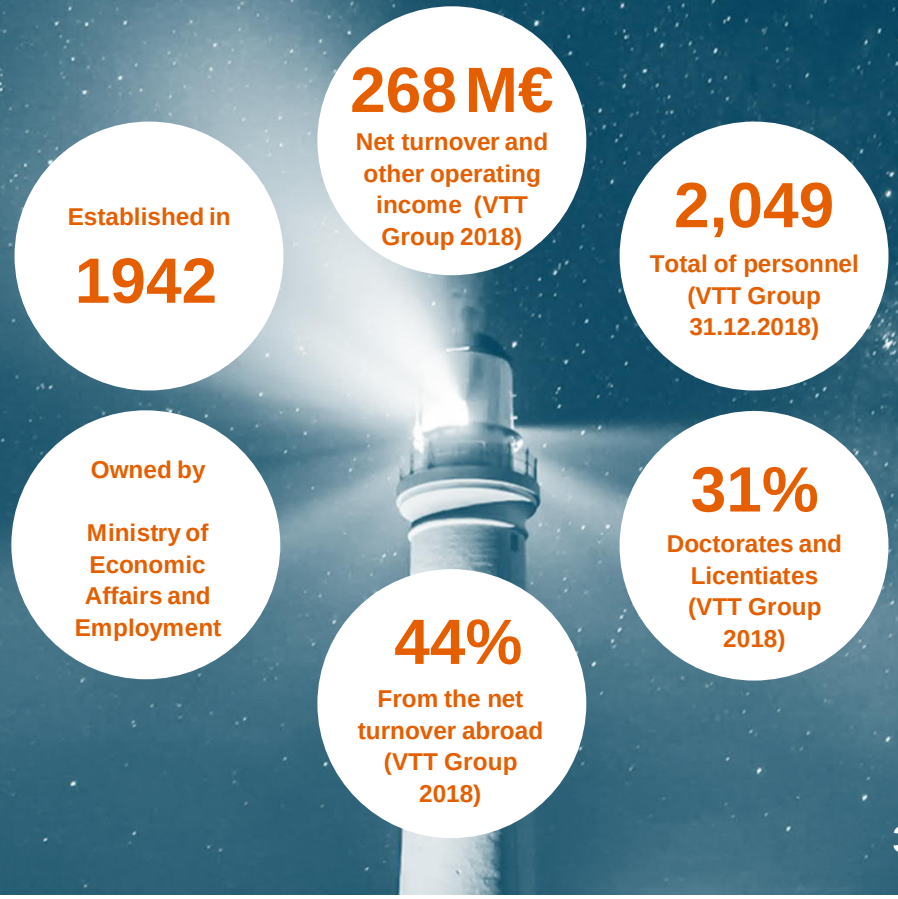
VTT – beyond the obvious

VTT is one of the leading research, development and innovation organizations in Europe. We help our customers and society to grow and renew through applied research. The business sector and the entire society get the best benefit from VTT when we solve challenges that require world-class know-how together and translate them into business opportunities.

Our vision
A brighter future is created through science-based innovations.

Our mission
Customers and society grow and renew through applied research.

Strategy
Impact through scientific and technological excellence.



Established in
1942

268 M€
Net turnover and other operating income (VTT Group 2018)

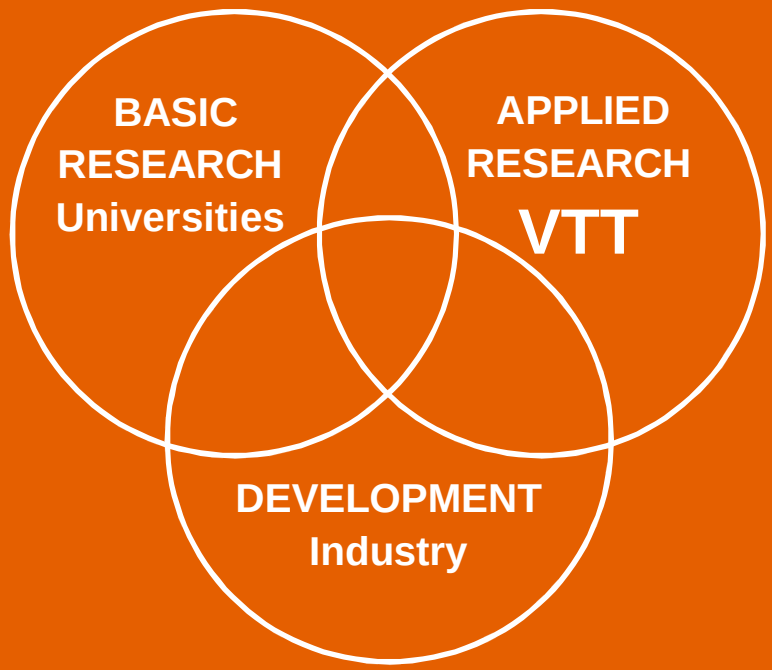
2,049
Total of personnel (VTT Group 31.12.2018)

Owned by
Ministry of Economic Affairs and Employment

31%
Doctorates and Licentiates (VTT Group 2018)

44%
From the net turnover abroad (VTT Group 2018)

VTT's status as performer of R&D work



VTT's business areas

- Sensing and integration
- Connectivity
- Data-driven solutions
- National Metrology Institute VTT MIKES
- Micronova manufacturing services

KNOWLEDGE INTENSIVE PRODUCTS AND SERVICES

SMART INDUSTRY AND ENERGY SYSTEMS

- Lifecycle solutions
- Nuclear safety
- Smart energy and transport solutions
- Digital engineering
- Business innovation foresight

- Industrial biotechnology and food solutions
- Biomass processing and products
- Sustainable energy and chemical technologies

SOLUTIONS FOR NATURAL RESOURCES AND ENVIRONMENT

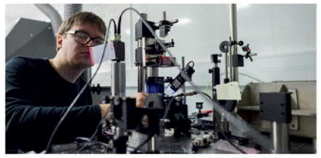
VTT's R&D infrastructure – an essential part of the national research infrastructure

VTT's research environments are world-class. They enable product development from basic research to piloting and even small-scale production.

Bioruukki
The largest bioeconomy pilot and research facility in the Nordic countries.

Biotechnology and food research piloting environment
offers unique facilities for the development and customisation of bio and food industry technologies.

Micronova
World-class cleanroom facility, fully equipped for the fabrication of silicon, glass and thin film-based microsystems.



VTT MIKES Metrology
is the National Metrology Institute of Finland and performs high-level metrological research and develops measuring applications in partnership with industry.

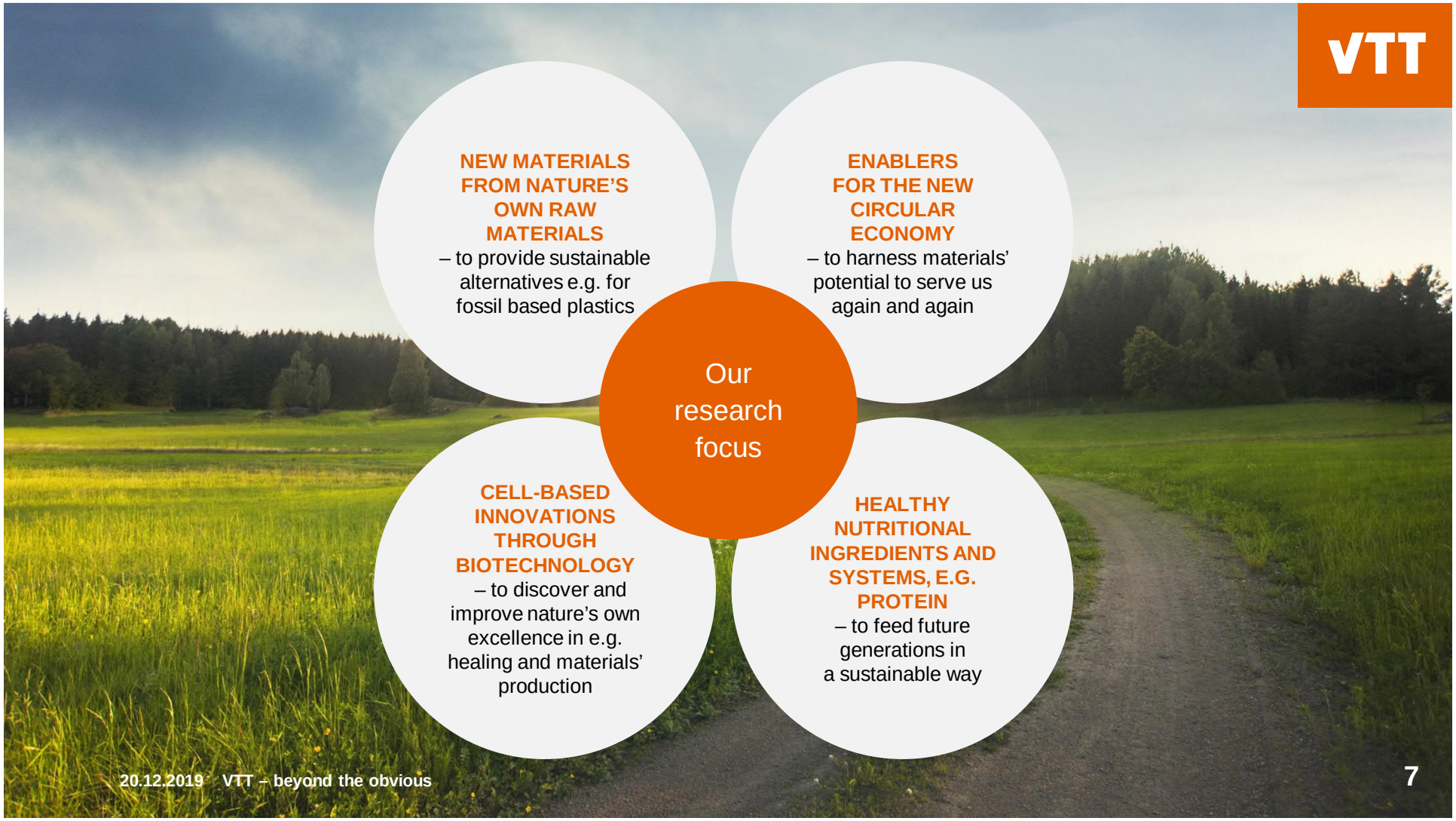
Engine and vehicle laboratory
enables research on passenger cars as well as heavy-duty vehicles up to 60 metric tons to develop energy efficiency, emissions reduction and use of 2nd generation biofuels.

PrintoCent
World's first pilot factory for printed intelligence industrialisation.

ROViR
Remote Operations and Virtual Reality Centre for the development of remote operations and virtual reality technology in industry.

A pilot-scale research environment for fibre processes
enables the development of novel products and supports the renewal of the pulp and paper industry.

Centre for Nuclear Safety
for nuclear technology safety research.


VTT
NEW MATERIALS FROM NATURE'S OWN RAW MATERIALS
– to provide sustainable alternatives e.g. for fossil based plastics
ENABLERS FOR THE NEW CIRCULAR ECONOMY
– to harness materials' potential to serve us again and again
Our research focus
CELL-BASED INNOVATIONS THROUGH BIOTECHNOLOGY
– to discover and improve nature's own excellence in e.g. healing and materials' production
HEALTHY NUTRITIONAL INGREDIENTS AND SYSTEMS, E.G. PROTEIN
– to feed future generations in a sustainable way

Drivers & Challenges

Drivers for bioeconomy

EU bans single use plastics
potential alternatives from bio-based materials

Consumers prefer green solutions

Sustainable production, Abundant raw material, Utilisation of side streams

Biodegradability & Compostability

"The force and influence of users and consumers in the market is increasing dramatically, driving demand for choice, functionality, quality, and environmental sustainability in packaging."
—Smithers Pira Report

Challenges for bioeconomy

Use of forest

- Use of forest must be balanced with their growth – limits for felling?
- Forests are needed as carbon sinks – IPCC report on global warming

Need for investments

Need for investments if not processable with existing machinery

Recycling

- Recycling must be solved – biodegradation is not the priority
- Brand owners banning multimaterials that are not recyclable

Properties vs. price

- Properties don’t meet the expected criteria e.g. water sensitivity
- Cannot cost more than the competing material
- If additional cost, added functionalities needed

Single-Use Plastics Directive is Published in the Official Journal of the EU

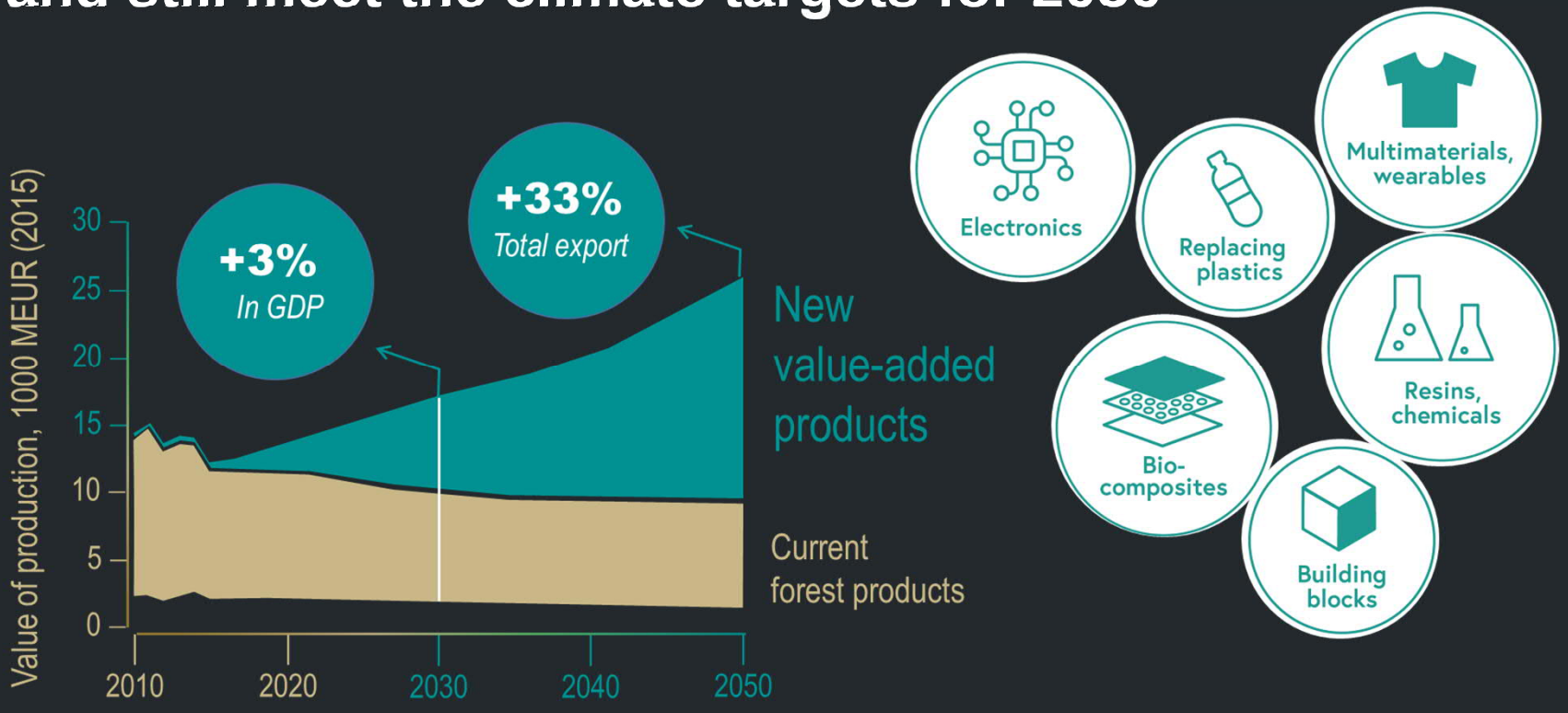
June 24, 2019

The Single-Use Plastics Directive — Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment—was published in the *Official Journal of the European Union* (click here to view). It will impact plastic food-contact materials and articles through, among others, a ban on certain single-use plastics, increased collection goals for plastic packaging, extended producer responsibility schemes, and design requirements for beverage containers.


10 most common plastic objects found on European beaches
Drink bottles
Food containers
Bags
Crisp packets/ sweet wrappers
Single-use plastic items represent
50 %
of marine litter
Cigarette butts
Cups & lids
Sanitary applications
Balloons and balloon sticks
Cutlery, straws & stirrers
Cotton buds
Source: Based on JRC report
#PlasticsStrategy
European Commission

Vision & actions

The value-added of forest industry can be doubled and still meet the climate targets for 2050



Source: Arasto, Antti; Koljonen, Tiina; Similä Lassi (eds.). 2018. Wealth from bioeconomy - Integrated bioeconomy and low carbon economy futures for Finland, VTT Technical Research Centre of Finland Ltd. Comparisons are made to year 2016. Disclaimer: Other versions of this graph are incorrect.

People and Planet

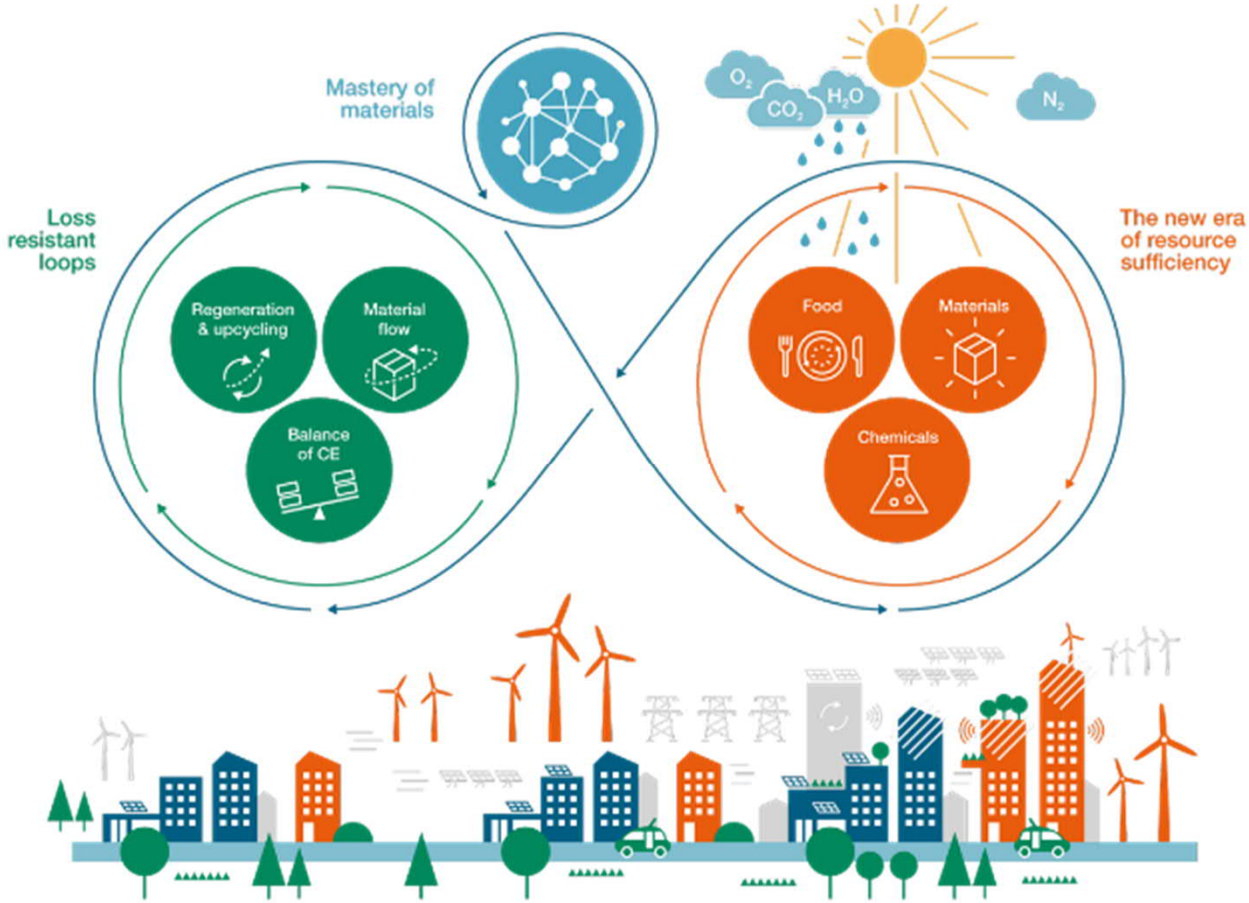
Desires & needs

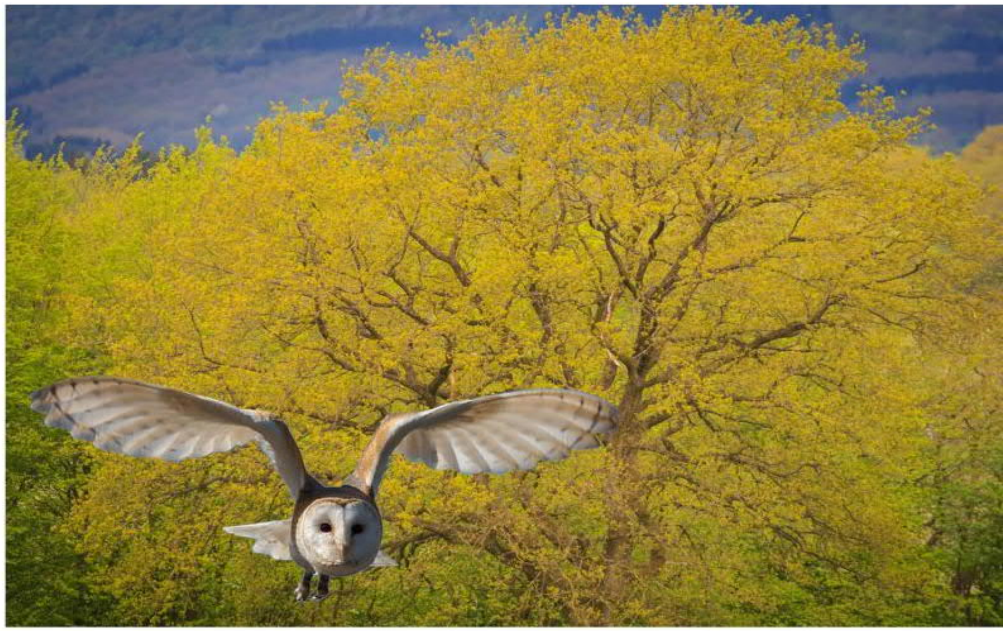
Expectations

Feasibility
TECHNICAL ASPECT

Viability
BUSINESS ASPECT

resource abundance resource insufficiency resource scarcity resource sufficiency





Bio-inspired innovation

> e.g. How does nature create lightweight structures, reduce noise, conserve energy?

Biomimicry is the art and science of studying the natural world, translating nature's time-tested, life-friendly strategies & principles and applying these to human design and organisational challenges.

Nature has billions of years of experience of what works and what doesn't in a resource-constrained environment. Organisms are quite inventive engineers that harvest energy, filter water, ventilate, give colour without paint, regulate complex systems, build adaptive & resilient ecosystems etc. And they do this without negative side effects such as pollution and waste.

PRESS RELEASE | 20 NOV.2019

Share

PRESS RELEASE 4evergreen: a unique industry alliance to boost the contribution of fibre-based packaging in a circular economy

Cepi, the European association representing the paper industry, announced today a new alliance called 4evergreen. The aim of the alliance is to boost the contribution of fibre-based packaging in a circular and sustainable economy that minimises climate and environmental impact.

The alliance will increase awareness about the benefits of fibre-based packaging materials, advocate for EU legislation supporting product design for recyclability and call for the development of optimised collection systems and appropriate recycling infrastructures.

The rise of environmental awareness and consumer concerns, as well as the increase of packaging focused regulation, such as the Single Use Plastics Directive, have helped companies to accelerate the development of alternative packaging materials including fibre-based packaging with a view to helping consumers make more climate-friendly choices.

4evergreen was created as a forum to engage and connect industry members from across the fibre-based packaging value chain, from paper and board producers to packaging converters, brand-owners and retailers, technology and material suppliers, waste sorters and collectors.

"Fibre-based packaging can be a game-changer for material substitution", says Eija Hietavuo, Chairwoman of 4evergreen and Senior Vice President Sustainability Stora Enso Consumer Board. *"Our common goal is to deliver a holistic approach to optimise the sustainability and circularity of the fibre-based packaging's life cycle."*

"The time to act is now!" says Jori Ringman, Director General at Cepi. *"Our industry already has a strong track record in environmental performance and recycling, but our ambition is higher. We are driving a system-wide shift to transition to the next level of circularity and climate resilience. 4evergreen will be the place for the whole industry value chain to co-create and collaborate for a change."*

The first 4evergreen alliance members include Nestlé, Danone, Mars, Stora Enso, Smurfit Kappa, Sappi, Metsä Board, UPM, Mayr-Melnhof Group, Reno de Medici, Mondi, Burgo, Kotkamills, DS Smith, Heinzel Group, Ahlstrom Munksjö, International Paper, BillerudKorsnäs, Huhtamäki, SEDA, SIG Combibloc, Tetra Pak, Elopak, Walki, Schur Group, Cardbox Packaging,

Biopolymer solutions @VTT

1. Cellulose nanomaterials
   – CNF / MFC
2. Thick cellulose foams
3. Biopolymers & biocomposites

EXTENSIVE KNOWLEDGE IN CELLULOSE NANOMATERIALS

VTT

>100
different raw materials used

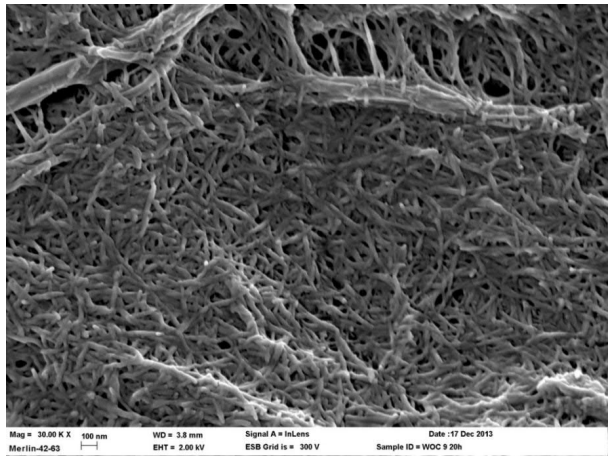
>2500
samples produced and analysed

>50
different partners & customers

~60M€
project portfolio since 2008

ENZYME ASSISTED HIGH CONSISTENCY FIBRILLATED CELLULOSE - HefCel

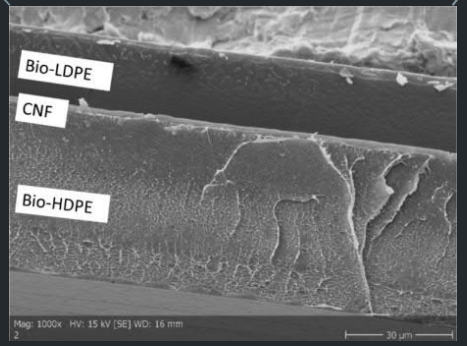
- Friction in low water content
- Cellulase enzymes
- Temperature control of enzyme activities during processing

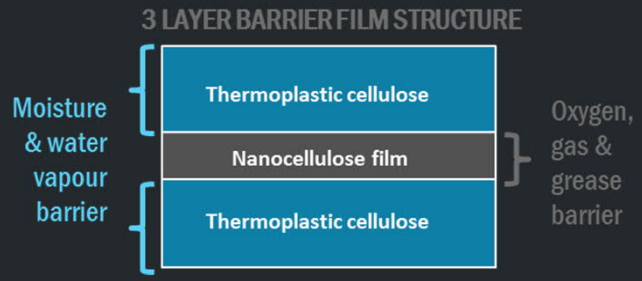


CNF APPLICATIONS AT VARIOUS TRL LEVELS

Bio-based stand-up pouch (SUP)

BIO-BASED BARRIER SOLUTION FOR SUSTAINABLE PACKAGING

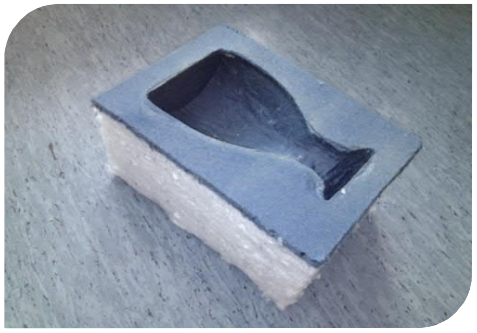





WOOD FIBRES & FOAM FORMING
TO REPLACE NON-RENEWABLE
PACKAGING MATERIALS?
impossible

Lightweight inner packages

- Light and soft fibrous cushioning element that protects the product from impacts
- Product shape made in manufacturing phase



Foam formed inner packages

Photos: Harri Kiiskinen and Juha Hakulinen VTT

Kiiskinen H., Torniainen E., Kinnunen K., Method of forming a fibrous product, WO 2015/036659 A1

Material replacing paper and plastic

PAPTIC LTD., A VTT SPIN-OFF COMPANY.

The novel wood fibre-based material PAPTIC® combines the renewability of paper with the resource efficiency and functionality of plastics.

Revolutionary, environmental new material replacing plastics. Made of sustainable wood fibre.

Biobased product of the Year Europe 2017

Bio-based packaging film

Customer: Woodly Oy

CHALLENGE

New bio-based and/or renewable material to replace plastics and to produce clear and biodegradable films in packaging applications.

SOLUTION

VTT designed material combinations which were tested in pilot environment.

A set of prototype films with alternative properties were manufactured.

BENEFIT

- Development of novel material with great opportunities on packaging film markets.
- Decrease amount of plastic waste with non-plastic wrapping film.

"We chose the unconventional way to do R&D and outsourced it entirely to VTT. It has turned out to be a great decision as we are now on the brink of commercializing our new, revolutionary film material."

Jaakko Kaminen
CEO
Woodly Oy

Our wood based biowrap is **the future of packaging**

Potential use of paper industry side streams in composites

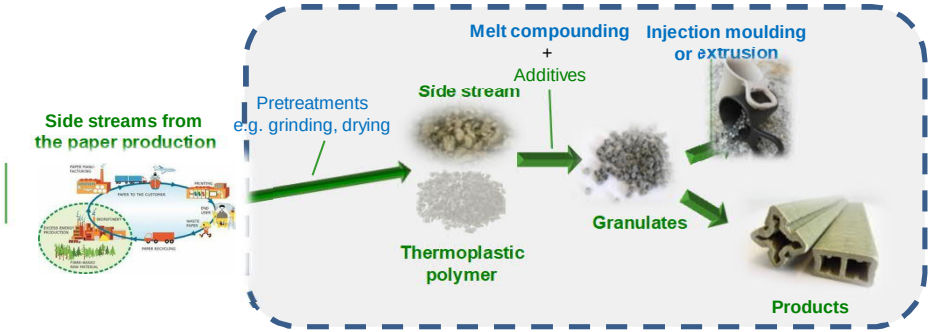
CHALLENGE

Significant amounts of valuable components such as fibres and mineral fillers are lost in the form of side streams.
Global demand for sustainable products is steadily increasing and new environmental concerns and waste disposal laws are pushing the industry to find new and alternative uses for waste residues.

BENEFIT

- improved composite properties
- decreased waste generation
- improved resource efficiency
- reduced environmental footprint
- added value for the side streams

SOLUTION



Realised

Side streams from paper industry successfully demonstrated as raw material (30 – 50 wt-%) in injection moulded and extruded products

Project : EU- Reffibre

The research leading to these results has received funding from the European Community's Seventh Framework Programme under grant agreement n° 604187
http://www.reffibre.eu/

Totally bio-based injection moulded chair

CHALLENGE

Bio-based injection mouldable thermoplastic composite material with the focus on high cellulose fibre content, good visual look, improved material performance and competitive price.

BENEFIT

- No petroleum based raw materials
- New additives improves the material properties enabling tc meet the material performance targets
- Material demonstrated in injection moulded end products

SOLUTION

VTT developed totally bio-based composite material which were demonstrated in injection moulded chair together with KO-HO Industrial design and Plastec Finland Oy.

KO-HO

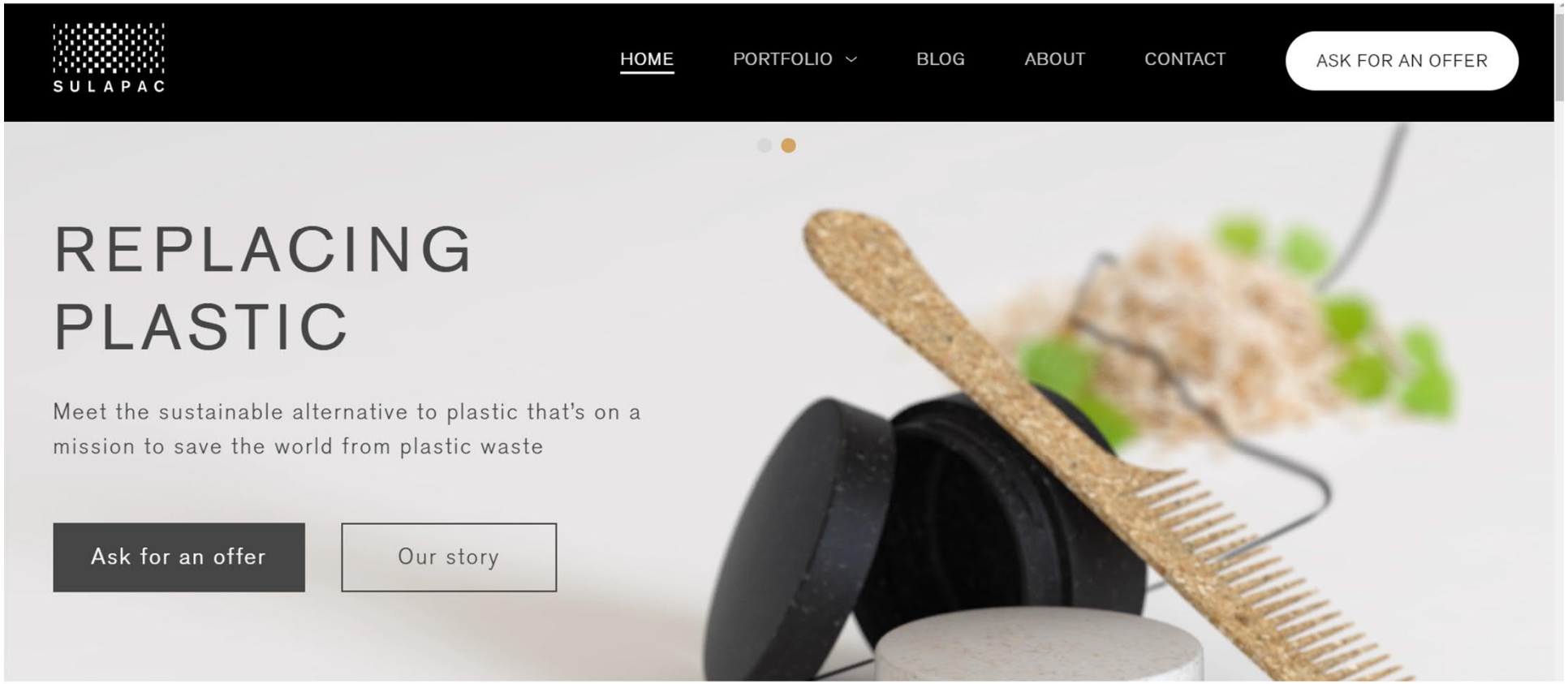
Plastec

CLIC

100%
Bio-based
30%
Cellulose

Material development was performed by VTT as a part of ACel program in the Clic Innovations Ltd (TEKES).

Commercial examples – packaging & textiles

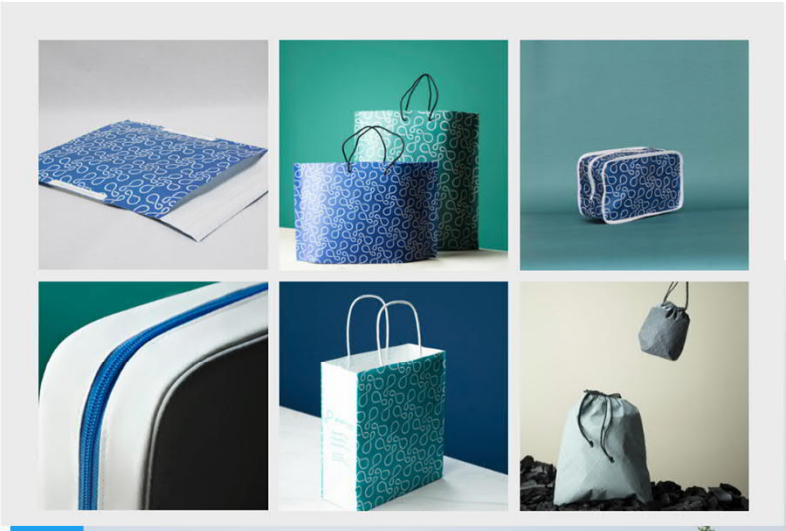

SULAPAC
HOME
PORTFOLIO
BLOG
ABOUT
CONTACT
ASK FOR AN OFFER
REPLACING PLASTIC
Meet the sustainable alternative to plastic that's on a mission to save the world from plastic waste
Ask for an offer
Our story

Stora Enso and Sulapac bring the sustainable straw to the market, with several customers signed up

STORA ENSO OYJ PRESS RELEASE 11 December 2019 at 9:00 EET

Stora Enso and Sulapac are launching a renewable and biodegradable straw to combat the global problem of plastic waste. The straw has strong usability and works just like a traditional straw. The new straws are available to brands and consumers looking for more eco-friendly solutions.

The first customers include Finnair's lounges in Helsinki, replacing their plastic and paper straws, food delivery platform Wolt, the alcoholic beverage brand company Altia, Hotel St. George, and vegan café Kippo, among others. The first customers represent different business sectors but have one common interest: to be at the forefront of sustainability. For end-consumers, the straws will be available in January via Biofutura.com, an online store specialising in compostable tableware and packaging, and online



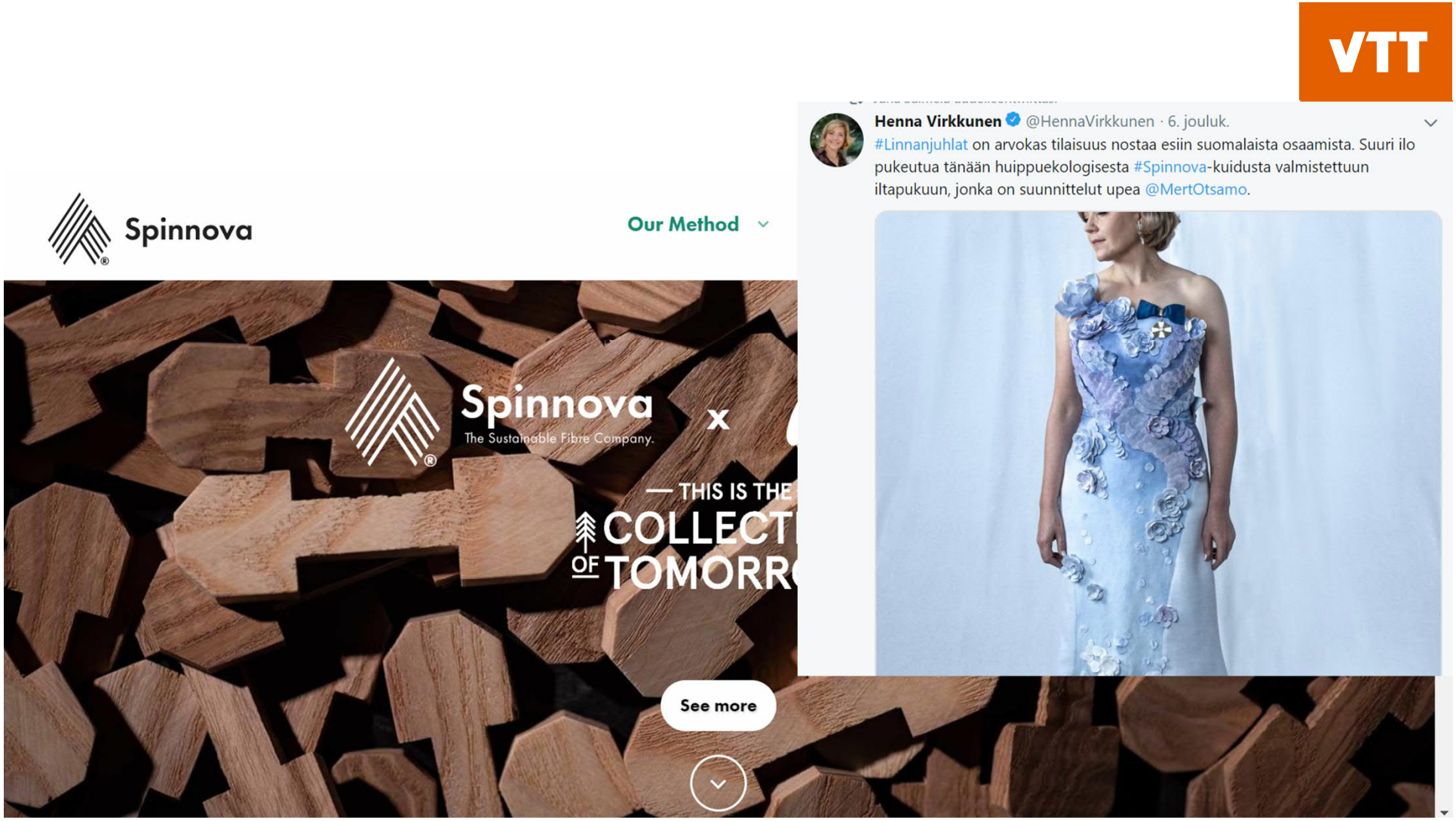
VTT

HOME CONTACT US BLOG

Paptic® is Replacing Plastic in Packaging

CONTACT US

720


Spinnova
Our Method
Spinnova
The Sustainable Fibre Company.
x
— THIS IS THE
COLLECT
OF TOMORR
See more
Henna Virkkunen @HennaVirkkunen · 6. jouluk.
#Linnanjuhlat on arvokas tilaisuus nostaa esiin suomalaista osaamista. Suuri ilo pukeutua tänään huippuekologisesta #Spinnova-kuidusta valmistettuun iltapukuun, jonka on suunnittelut upea @MertOtsamo.

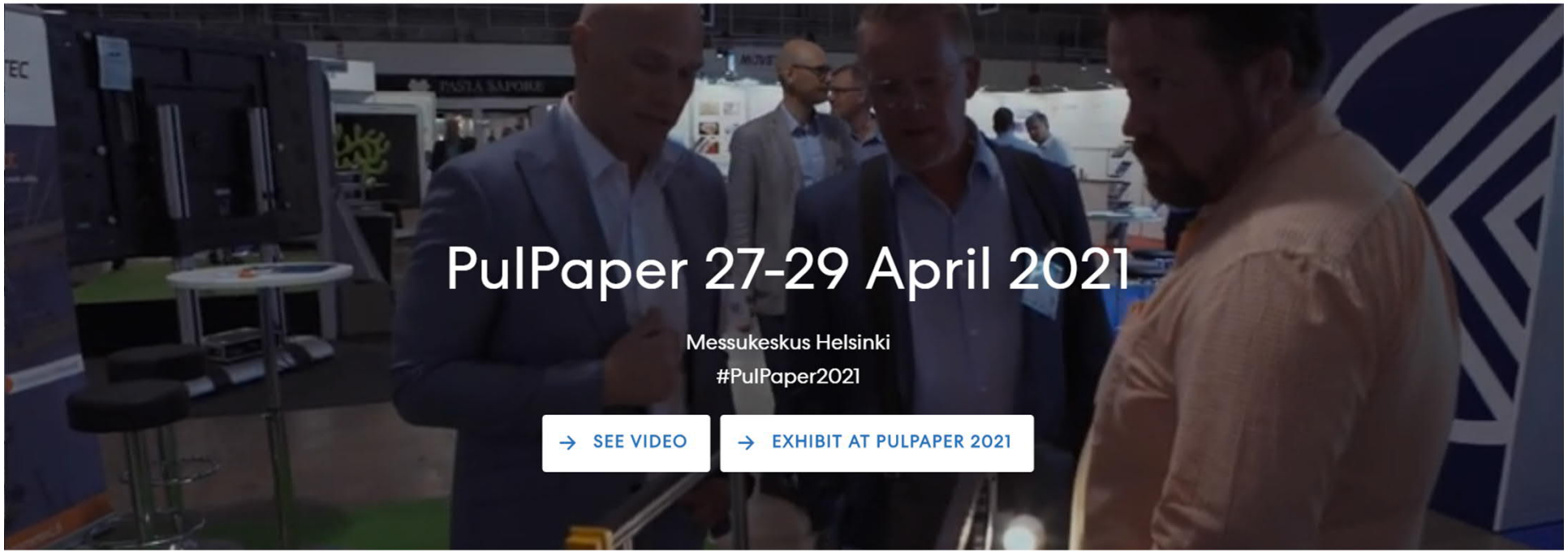
VTT

INFINITEDFIBER

peak Contact

We at Infinited Fiber want to save the planet together with You.

https://conference.tappinano.org



https://pulpaper.messukeskus.com/

beyond
the obvious

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